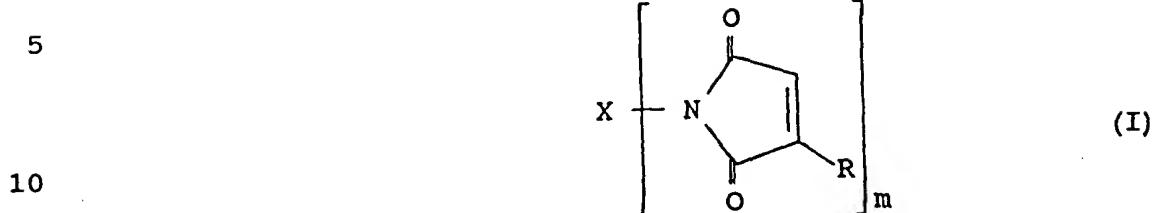


That which is claimed is:

1. A bismaleimide composition having the structure:



wherein:

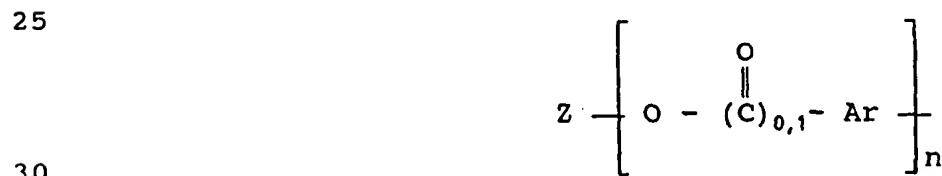
15                    $m = 1, 2 \text{ or } 3,$

each R is independently selected from hydrogen or lower alkyl, and

X is a monovalent or polyvalent radical selected from:

20                   branched chain alkyl, alkylene or alkylene oxide species having from about 12 to about 500 carbon atoms,

aromatic groups having the structure:



wherein:

35

$n = 1, 2$  or  $3$ ,  
 each Ar is a monosubstituted,  
 disubstituted or trisubstituted  
 aromatic or heteroaromatic ring having  
 in the range of 3 up to 10 carbon  
 atoms, and

40

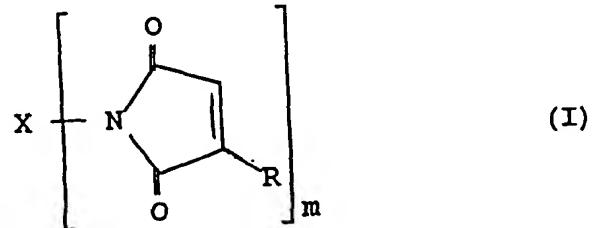
Z is a branched chain alkyl,  
 alkylene or alkylene oxide species  
 having from about 12 to about 500 atoms  
 in the backbone thereof,

or mixtures thereof.

2. A thermosetting resin composition comprising:  
 (a) a maleimide composition having the structure:

5

10



wherein:

15

$m = 1, 2$  or  $3$ ,

each R is independently selected from  
 hydrogen or lower alkyl, and

X is a monovalent or polyvalent radical  
 selected from:

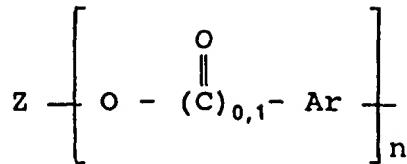
20

branched chain alkyl, alkylene or  
 alkylene oxide species having from  
 about 12 to about 500 carbon atoms,

aromatic groups having the  
structure:

25

30



wherein:

$n = 1, 2$  or  $3$ ,

35

each  $Ar$  is a monosubstituted,  
disubstituted or trisubstituted  
aromatic or heteroaromatic ring having  
in the range of 3 up to 10 carbon  
atoms, and

40

$Z$  is a branched chain alkyl,  
alkylene or alkylene oxide species  
having from about 12 to about 500 atoms  
in the backbone thereof,

or mixtures thereof;

45

(b) in the range of 0.2 up to 3 wt % of at least one free  
radical initiator, based on the total weight of  
the composition; and

(c) optionally, a diluent for the bismaleimide composition.

3. The thermosetting resin composition according  
to claim 2, further comprising

5

(d) in the range of 0.1 up to 10 wt % of at least one  
coupling agent, based on the total weight of the  
composition.

4. The thermosetting resin composition according to claim 3, wherein the composition has a viscosity of from about 10 to about 12,000 centipoise.

5. The thermosetting resin composition according to claim 3, wherein the composition has a viscosity of from about 10 to about 2,000 centipoise.

6. The thermosetting resin composition according to claim 3, wherein the diluent is selected from dimethylformamide, dimethylacetamide, N-methylpyrrolidone, toluene, xylene, methylene chloride, tetrahydrofuran, 5 glycol ethers, methyl ethyl ketone or monoalkyl or dialkyl ethers of ethylene glycol, polyethylene glycol, propylene glycol or polypropylene glycol.

7. The thermosetting resin composition according to claim 3, wherein the free radical initiator is selected 10 from peroxides or azo compounds.

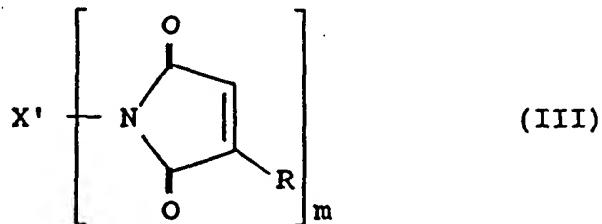
8. The thermosetting resin composition according to claim 3, wherein the coupling agent is selected from silicate esters, metal acrylate salts, titanates or compounds containing a co-polymerizable group and a 15 chelating ligand.

9. A thermosetting resin composition comprising:

(a) a maleimide having the structure:

5

10



wherein:

15

 $m = 1, 2 \text{ or } 3,$ 

each R is independently selected from hydrogen or lower alkyl, and

X' is selected from:

20

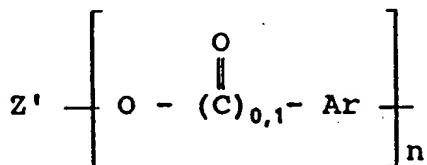
saturated straight chain alkyl, alkylene or alkylene oxide, or branched chain alkyl, alkylene or alkylene oxide, optionally containing saturated cyclic moieties as substituents on said alkyl, alkylene or alkylene oxide chain or as part of the backbone of the alkyl, alkylene or alkylene oxide chain, wherein said species have at least 6 carbon atoms,

25

30

aromatic groups having the structure:

35



wherein

$n = 1, 2 \text{ or } 3,$

40

each Ar is a monosubstituted, disubstituted or trisubstituted aromatic or heteroaromatic ring having in the range of 3 up to 10 carbon atoms, and

Z' is selected from:

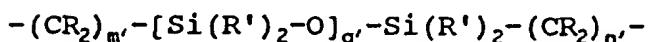
45

saturated straight chain alkyl, alkylene or alkylene oxide, or branched chain alkyl, alkylene or alkylene oxide, optionally containing saturated cyclic moieties as substituents on said alkyl, alkylene or alkylene oxide chain or as part of the backbone of the alkyl, alkylene or alkylene oxide chain, wherein said species have at least 6 carbon atoms,

50

55

siloxanes having the structure:



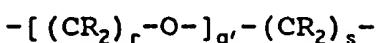
60

65

wherein each R is independently defined as above, and each R' is independently selected from hydrogen, lower alkyl or aryl, m' falls in the range of 1 up to 10, n' falls in the range of 1 up to 10, and q' falls in the range of 1 up to 50,

polyalkylene oxides having the structure:

70

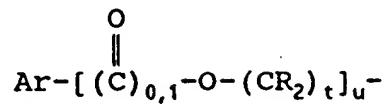


75

wherein each R is independently as defined above, r falls in the range of 1 up to 10, s falls in the range of 1 up to 10, and q' is as defined above,

aromatic moieties having the structure:

80



wherein each R is independently as defined above, t falls in the range of 2 up to 10, u is 1, 2 or 3, and Ar is as defined above,

85

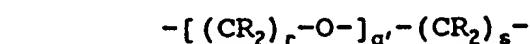
polysiloxanes having the structure:

90

wherein each R and R' is independently defined as above, and wherein each of m', n' and q is as defined above,

polyalkylene oxides having the structure:

95

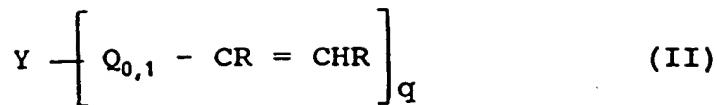


wherein each R is independently as defined above, and wherein each of r, s and q' is as defined above,

as well as mixtures of any two or more thereof,

(b) in the range of about 0.01 up to about 10 equivalents of a vinyl compound per equivalent of maleimide, wherein said vinyl compound has the structure:

105



wherein:

q is 1, 2 or 3,

each R is independently as defined above,

110

each Q is independently selected from -O-, -O-C(O)-, -C(O)- or -C(O)-O-, and

Y is selected from:

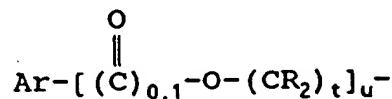
115

saturated straight chain alkyl, alkylene or alkylene oxide, or branched chain alkyl, alkylene or alkylene oxide, optionally containing saturated cyclic moieties as substituents on said alkyl, alkylene or alkylene oxide chain or as part of the backbone of the alkyl, alkylene or alkylene oxide chain, wherein said species have at least 6 carbon atoms,

120

aromatic moieties having the structure:

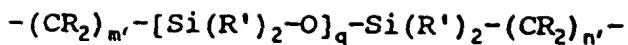
125



130

wherein each R is independently as defined above, and each of Ar, t and u is as defined above,

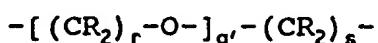
siloxanes having the structure:



135

wherein each R and R' is independently defined as above, and wherein each of m', n' and q is as defined above,

polyalkylene oxides having the structure:



140

wherein each R is independently as defined above, and wherein each of r, s and q' is as defined above,

as well as mixtures of any two or more thereof,

145

(c) in the range of 0.2 up to 3 wt % of at least one free radical initiator, based on the total weight of the composition.

10. A thermosetting resin composition according to claim 9 further comprising

(d) in the range of 0.1 up to 10 wt % of at least one coupling agent, based on the total weight of the composition.

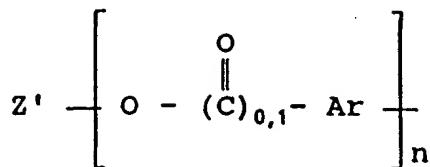
11. A thermosetting resin composition according to claim 10 wherein X' is a polyvalent radical selected from:

5

branched chain alkylene species having from about 12 to about 500 carbon atoms,

aromatic groups having the structure:

10



15

wherein

$$n = 1, 2 \text{ or } 3,$$

20

each Ar is a monosubstituted, disubstituted or trisubstituted aromatic or heteroaromatic ring having in the range of 3 up to 10 carbon atoms, and

25

Z' is a branched chain alkyl, alkylene or alkylene oxide species having from about 12 to about 500 carbon atoms,

or mixtures thereof.

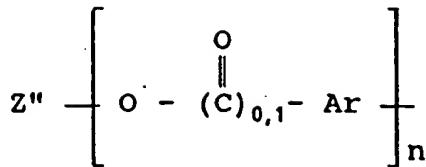
12. A thermosetting resin composition in accordance with claim 10 wherein Y is a polyvalent radical selected from:

5

branched chain alkylene or alkylene oxide species having from about 12 to about 500 carbon atoms,

aromatic groups having the structure:

10



15

wherein

$$n = 1, 2 \text{ or } 3,$$

20

each Ar is a monosubstituted, disubstituted or trisubstituted aromatic or heteroaromatic ring having in the range of 3 up to 10 carbon atoms, and

Z'' is a branched chain alkylene or alkylene oxide species having from about 12 to about 500 carbon atoms,

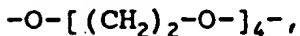
25

or mixtures thereof.

13. A thermosetting resin composition according to claim 12 wherein Q is  $-\text{C}(\text{O})-\text{O}-$ .

14. A thermosetting resin composition according to claim 10 wherein X' is derived from a dimer amine, and includes  $-(\text{CH}_2)_9-\text{CH}(\text{C}_8\text{H}_{17})-\text{CH}(\text{C}_8\text{H}_{17})-(\text{CH}_2)_9-$ .

15. A thermosetting resin composition according to claim 10 wherein Y is selected from stearyl, behenyl, eicosyl, isoeicosyl, as well as:



5  $-(\text{CH}_2)_4-\text{O}-\text{(C}_3\text{N}_3)-[\text{O}-(\text{CH}_2)_4]_2-$ , wherein  $-\text{(C}_3\text{N}_3)-$  is a 2,4,6-trisubstituted 1,3,5-triazine;

$-(\text{CH}_2)_4-\text{O}-\begin{array}{c} \text{O} \\ \parallel \\ \text{C} \end{array}-\text{Ar}-\begin{array}{c} \text{O} \\ \parallel \\ \text{C} \end{array}-\text{O}-(\text{CH}_2)_4-$ , wherein  $-\text{Ar}-$  is a 1,3-disubstituted phenyl ring;

10

Y is derived from a dimer amine, and includes  
 $-(CH_2)_9-CH(C_8H_{17})-CH(C_8H_{17})-(CH_2)_9-$ ;  
 optionally hydrogenated  $\alpha,\omega$ -disubstituted  
 polybutadienes, optionally hydrogenated  $\alpha,\omega$ -disubstituted  
 15 polyisoprenes, optionally hydrogenated  $\alpha,\omega$ -disubstituted  
 poly[(1-ethyl)-1,2-ethane].

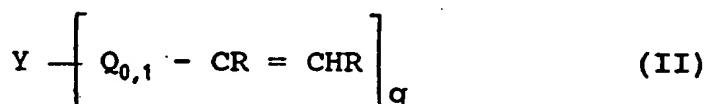
16. A thermosetting resin composition according to claim 11 wherein X' and Y are not both aromatic.

17. A thermosetting resin composition according to claim 9, wherein the free radical initiator is selected from peroxides or azo compounds.

18. A thermosetting resin composition according to claim 10 wherein the coupling agent is selected from silicate esters, metal acrylate salts, titanates or compounds containing a co-polymerizable group and a chelating ligand.

19. A polyvinyl composition having the structure:

5



wherein:

q is 1, 2 or 3,

10

each R is independently selected from hydrogen or lower alkyl,

Q is  $-C(O)-O-$ , and

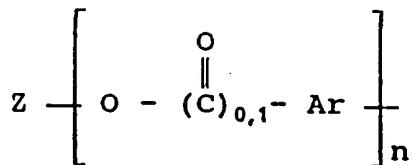
Y is selected from:

15

branched chain alkylene or alkylene oxide species having from about 12 to about 500 carbon atoms,

aromatic groups having the structure:

20



wherein

25

$n = 1, 2$  or  $3$ ,

30

each Ar is a monosubstituted, disubstituted or trisubstituted aromatic or heteroaromatic ring having in the range of 3 up to 10 carbon atoms, and

Z is a branched chain alkylene or alkylene oxide species having from about 12 to about 500 carbon atoms,

or mixtures thereof.

20. A thermosetting resin composition comprising

(a) a divinyl composition according to claim 19, and

(b) a sufficient amount of at least one free radical initiator.

21. The thermosetting resin composition in accordance with claim 20, further comprising

(c) a sufficient amount of at least one coupling agent, based on the total weight of the composition.

22. The thermosetting resin composition in accordance with claim 20, wherein the free radical initiator is selected from peroxides or azo compounds.

23. The thermosetting resin composition in accordance with claim 21, wherein the coupling agent is selected from silicate esters, metal acrylate salts, titanates or compounds containing a copolymerizable group 5 and a chelating ligand.

24. An assembly comprising a first article permanently adhered to a second article by a cured aliquot of the thermosetting resin composition according to claim 3.

25. An assembly comprising a first article permanently adhered to a second article by a cured aliquot of the thermosetting resin composition according to claim 10.

26. An assembly comprising a first article permanently adhered to a second article by a cured aliquot of the thermosetting resin composition according to claim 19.

27. A die-attach paste comprising:

in the range of about 10 up to 80 wt % of the thermosetting resin composition according to claim 3, and

5 in the range of about 20 up to 90 wt % of a conductive filler.

28. A die-attach paste comprising:

in the range of about 10 up to 80 wt % of the thermosetting resin composition according to claim 10, and

5 in the range of about 20 up to 90 wt % of a conductive filler.

29. A die-attach paste comprising:

in the range of about 10 up to 80 wt % of the thermosetting resin composition according to claim 19, and

5 in the range of about 20 up to 90 wt % of a conductive filler.

30. A die-attach paste according to claim 27 wherein the conductive filler is electrically conductive.

31. A die-attach paste according to claim 28 wherein the conductive filler is electrically conductive.

32. A die-attach paste according to claim 29 wherein the conductive filler is electrically conductive.

33. A die-attach paste according to claim 27 wherein said conductive filler is thermally conductiv .

34. A die-attach paste according to claim 28 wherein said conductive filler is thermally conductive.

35. A die-attach paste according to claim 29 wherein said conductive filler is thermally conductive.

36. An assembly comprising a microelectronic device permanently adhered to a substrate by a cured aliquot of the die attach paste according to claim 27.

37. An assembly comprising a microelectronic device permanently adhered to a substrate by a cured aliquot of the die attach paste according to claim 28.

38. An assembly comprising a microelectronic device permanently adhered to a substrate by a cured aliquot of the die attach paste according to claim 29.

39. A method for adhesively attaching a first article to a second article, said method comprising:

(a) applying composition according to claim 27 to said first article,

5 (b) bringing said first and second article into intimate contact to form an assembly wherein said first article and said second article are separated only by the adhesive composition applied in step (a), and thereafter,

10 (c) subjecting said assembly to conditions suitable to cure said adhesive composition.

40. A method for adhesively attaching a first article to a second article, said method comprising:

(a) applying composition according to claim 28 to said first article,

5 (b) bringing said first and second article into intimate contact to form an assembly wherein said first article and said second article are separated only by the adhesive composition applied in step (a), and thereafter,

10 (c) subjecting said assembly to conditions suitable to cure said adhesive composition.

41. A method for adhesively attaching a first article to a second article, said method comprising:

(a) applying composition according to claim 29 to said first article,

(b) bringing said first and second article into intimate contact to form an assembly wherein said first article and said second article are separated only by the adhesive composition applied in step (a), and thereafter,

(c) subjecting said assembly to conditions suitable to cure said adhesive composition.

42. A method for adhesively attaching a microelectronic device to a substrate, said method comprising:

5 (a) applying die attach paste according to claim 27 to said substrate and/or said microelectronic device,

10 (b) bringing said substrate and said device into intimate contact to form an assembly wherein said substrate and said device are separated only by the die attach composition applied in step (a), and thereafter,

(c) subjecting said assembly to conditions suitable to cure said die attach composition.

43. A method for adhesively attaching a microelectronic device to a substrate, said method comprising:

5 (a) applying die attach paste according to claim 28 to said substrate and/or said microelectronic device,

10 (b) bringing said substrate and said device into intimate contact to form an assembly wherein said substrate and said device are separated only by the die attach composition applied in step (a), and thereafter,

(c) subjecting said assembly to conditions suitable to cure said die attach composition.

44. A method for adhesively attaching a microelectronic device to a substrate, said method comprising:

5 (a) applying die attach paste according to claim 29 to said substrate and/or said microelectronic device,

10 (b) bringing said substrate and said device into intimate contact to form an assembly wherein said substrate and said device are separated only by the die attach composition applied in step (a), and thereafter,

(c) subjecting said assembly to conditions suitable to cure said die attach composition.

45. Method for the preparation of bismaleimides from diamines, said method comprising:

5 adding diamine to a solution of maleic anhydride, adding acetic anhydride to said solution once diamine addition is complete, and then allowing the resulting mixture to stir for at least 12 hours, and thereafter

treating the resulting reaction mixture with a suitable isomerizing agent.